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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT(S): Shigeru Nishio et al.

SERIAL NO: 10/567,657

EXAMINER: LEGESSE, HENOK D

FILED: October 26, 2006

GROUP: 2861

FOR: ELECTROSTATIC SUCTION TYPE FLUID
DISCHARGE METHOD AND DEVICE FOR THE SAME

Mail Stop: AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

RESPONSE TO NON-FINAL OFFICIAL
ACTION REQUIRING ELECTION/RESTRICTION
AND REQUEST FOR RECONSIDERATION

This is in response to the currently outstanding non-final Official Action in the above-identified application.

Claims 1-20 are pending in the above-identified application and are subject to an election of invention requirement as well as an election of species requirement.

More specifically, in the currently outstanding non-final Official Action, the Examiner has:

1. Identified the following allegedly distinct inventions among which the Applicant is required to elect for prosecution on the merits on the basis that the inventions or groups of inventions are not so linked as to form a single inventive concept under PCT Rule 13.1:

Group I, claim 1, drawn to an electrostatic suction type fluid discharge device, with pre-charge voltage provided immediately before a rise of the pulse voltage, pre-charge voltage having same polarity as the upper limit voltage, with absolute value of the pre-charge voltage being smaller than the minimum voltage of induced discharge.

Group II, claim(s) 2, 7, drawn to an electrostatic suction type fluid discharge device with attenuation facilitating voltage provided immediately after a fall of the pulse voltage, with the attenuation facilitating voltage having an opposite polarity to that of the upper limit voltage.

Group III, claim(s) 3, 7, drawn to an electrostatic suction type fluid discharge device the pre-charge voltage having an opposite polarity to that of the upper limit voltage.

Group IV, claim 4, drawn to an electrostatic suction type fluid discharge device with attenuation facilitating voltage having same polarity to that of the upper limit voltage, with absolute value of the pre-charge voltage being smaller than the pre-charge voltage.

Group V, claim 5, drawn to an electrostatic suction type fluid discharge device with a pre-charge voltage is provided immediately before starting application of the DC voltage, the pre-charge voltage having a same polarity as that of the DC voltage, an absolute value of the DC voltage being set smaller than the minimum voltage to induce discharge.

Group VI, claim(s) 6, 7, drawn to an electrostatic suction type fluid discharge device with an attenuation facilitating voltage provided immediately after an end of application of the DC voltage, the attenuation facilitating voltage having an opposite polarity to that of the DC voltage.

Group VII, claim 8, drawn to an electrostatic suction type fluid discharge method with fluid discharge hole having a diameter ranging from 1 μm to 5 μm , a pre-charge voltage provided immediately before a rise of the voltage, the pre-charge voltage having a same polarity as that of the voltage, an absolute value of the voltage being set smaller than the minimum voltage to induce discharge.

Group VIII, claim 9, drawn to an electrostatic suction type fluid discharge method with the voltage being equal to or greater than a minimum voltage to induce discharge, an attenuation facilitating voltage is provided immediately after a fall of the voltage, the attenuation facilitating voltage having an opposite polarity to that of the voltage.

Group IX, claim(s) 10, 12, drawn to an electrostatic suction type fluid discharge device with line-drawing means controlling a speed of the relative movement, in accordance with a period of intermittent discharge which is performed at a frequency depending on the voltage and an electric conductivity of the fluid.

Group X, claim(s) 11, 12, drawn to an electrostatic suction type fluid discharge device with line-drawing means controlling the voltage, the discharge pattern being discharged intermittently, and being determined depending on a speed of the relative movement.

Group XI, claim 13, drawn to an electrostatic suction type fluid discharge device with line-drawing means carrying out line drawing with a scanning speed and a voltage specified as: $V_{in} > 31v + 75$ where v is scanning speed, and V_{in} is the voltage, provided that an electric conductivity of the fluid is in a range of 10^{-7} — 10^{-9}S/cm .

Group XII, claim 14, drawn to an electrostatic suction type fluid discharge method with step to carry out line-drawing, the voltage being equal to or greater than a minimum voltage to induce discharge, controls speed of the relative movement to discharge pattern partly overlaid in accordance with a period of intermittent discharge at a frequency depending on the voltage and an electric conductivity of the fluid.

Group XIII, claim 15, drawn to an electrostatic suction type fluid discharge method with step to carry out line-drawing, the voltage being equal to or greater than a minimum voltage to induce discharge, controls speed of the relative movement to discharge pattern partly overlaid discharged intermittently, and being determined depending on a speed of the relative movement.

Group XIV, claim 16, drawn to an electrostatic suction type fluid discharge device with nozzle diameter range between 1 to 5 μm , with a voltage value = V_0 , and an application time = t , $130\text{V} < V_0 [1 - \exp(-t/RC)]$ where R is resistance of the fluid, C is capacitance between the fluid in a tip of the nozzle and the discharge target.

Group XV, claim 17, drawn to an electrostatic suction type fluid discharge device with nozzle diameter range between 1 to 5 μm , with a voltage value = V_0 , and an application time = t , $130\text{V} < V_0 [1 - \exp(-t/RC)] < 250$ where R is resistance of the fluid, C is capacitance between the fluid in a tip of the nozzle and the discharge target.

Group XVI, claim 18, drawn to an electrostatic suction type fluid discharge device with nozzle diameter range between 1 to 5 μm , with a voltage value = V_0 , and an application time = t , $130\text{V} < V_0 [1 - \exp(-t/RC)] < 250$, $V_0 < 250$ where R is resistance of the fluid, C is capacitance between the fluid in a tip of the nozzle and the discharge target.

Group XVII, claim 19, drawn to an electrostatic suction type fluid discharge device with nozzle diameter range between 1 to 5 μm , with the device satisfy $V_H = -0.001X^2 + 0.44X + 125$ $V_L = -0.0013X^2 + 0.69X + 160$ where X is distance between the nozzle and the discharge target, and V_H and V_L express maximum and minimum values of discharge start voltage.

Group XVIII, claim 20, drawn to an electrostatic suction type fluid discharge method with nozzle diameter range between 1 to 5 μm , with a voltage value = V_o , and an application time = t, $130V < V_o [1 - \exp(-t/RC)]$ where R is resistance of the fluid, C is capacitance between the fluid in a tip of the nozzle and the discharge target.

In particular, the Examiner asserts that the inventions listed as Groups I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII, XIV, XV, XVI, XVII, and XVIII do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: The groups listed above are not within the permitted combination of different categories of inventions, that is, the twelve apparatuses and five method groups. As set forth in PCT/JPO4/11376, there is no special technical feature that defines a contribution over the prior art, JP 10-52917A, JP 63-7946 A, and JP 7-223317 A define common technical features.

2. Furthermore, the Examiner states that the application contains claims directed to more than one species of the generic invention. These species are deemed to lack unity of invention because they are not so linked as to form a single general inventive concept under PCT Rule 13.1.

The species are as follows:

- A. The embodiment of Fig.9 (electrostatic suction type fluid discharge device according to Fig.9).
- B. The embodiment of Fig.18 (electrostatic suction type fluid discharge device according to Fig.18).
- C. The embodiment of Fig.25 (electrostatic suction type fluid discharge device according to Fig.25).

3. Required the Applicant in addition to elect one of the following disclosed species. These species are deemed to lack unity of invention because they are not so linked as to form a single general inventive concept under PCT Rule 13.1.

The species are as follows:

- i. The embodiment of Figs.1a, 1b (pulse voltage according to Figs. 1a,1b).
 - ii. The embodiment of Figs.10a,10b (pulse voltage according to Figs. 10a,10b).
 - iii. The embodiment of Figs.12a,12b (pulse voltage according to Figs. 12a,12b).
 - iv. The embodiment of Fig.14 (pulse voltage according to Fig. 14).
 - v. The embodiment of Figs.15a,15b (pulse voltage according to Figs. 15a,15b).
 - vi. The embodiment of Figs.16a,16b (pulse voltage according to Figs. 16a,16b).
4. Indicated that upon the allowance of a generic claim, Applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. Furthermore, if claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

6. Indicated that the species listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, the species lack the same or corresponding special technical features for the following reasons: As set forth in PCT/GB03/05626, there is no special technical feature that defines a contribution over the prior art.

In response to the currently outstanding requirement for restriction, **Applicant hereby elects the invention of Group IX and Species B. The Claims that are presently deemed to correspond to Group IX and Species B are claims 10 and 12.**

The Examiner further has requested that the Applicant elect one of Species (i) – (vi). However, Applicant respectfully submits that Species (i) – (vi) are related to Group I-VIII and Species A, but not related to Group IX and Species B. **Accordingly, election of one of Species (i) – (vi) is impossible.**

REQUEST FOR RECONSIDERATION OF
RESTRICTION REQUIREMENTS

Applicant also hereby requests reconsideration of the presently outstanding Restriction/Election requirement on the grounds that the present application contains three inventions, and therefore the application should be divided not into eighteen inventions (Groups) I- XVIII, but rather into three inventions (Groups). More specifically, Applicants respectfully submit that the present application should be divided into three inventions (Groups) (1)-(3) as set forth below, in accordance with Species A-C acknowledged by the Examiner. In this regard, the objects of the individual inventions, effects yielded by the individual inventions, and claims corresponding to the individual inventions are as follows:

Invention (Group) (1): Species A: claims 1-9

Object: To overcome a problem caused by miniaturization of the diameter of the tip of a nozzle, i.e. a problem that when the discharge amount becomes significantly small, the discharge response suddenly slows down exponentially, making the high-frequency drive difficult.

Effect of Invention: Discharge-start response or discharge-end response is improved, thereby improving the discharge limit frequency, making the high-frequency driving possible.

Invention (Group) (2): Species B: claims 10-15

Object: To overcome a problem caused by miniaturization of the diameter of the tip of a nozzle, i.e. a problem that an electric resistance is increased and discharge response is deteriorated, making stable line-drawing difficult when drawing a line with a super-miniaturized width.

Effect of Invention: The speed of relative movement of the nozzle and the substrate is controlled or a voltage applied between the nozzle and the substrate is controlled so that adjacent ones of discharge pattern are partially overlaid with each other, thereby allowing a continuous and stable line-drawing.

Invention (Group) (3): Species C: claims 16-20

Object: In conventional fluid discharge devices, miniaturization of the nozzle diameter requires more intense electric field to cause the fluid to be discharged, and therefore the miniaturization of the nozzle diameter contradicts with decrease in drive voltage. In order to overcome this problem, it is intended to achieve both the miniaturization of the nozzle diameter and the decrease in drive voltage based on such a new finding that a micro nozzle diameter causes a local electric field, which allows the fluid to be discharged by a lower drive voltage.

Effect of Invention: It is possible to achieve both the miniaturization of the nozzle diameter and the decrease in drive voltage.

Applicant also respectfully requests the Examiner to examine the above invention (Group) (2) corresponding to Species B and claims 10-15. In this regard, please note that Group IX and Species B elected in the item 1, are contained in the invention (Group) (2).

Applicants respectfully submit that this communication is fully responsive to the currently outstanding Official Action in the above-identified application. Consequently, early substantive consideration and allowance are respectfully requested.

Further, it is respectfully noted for the record that the currently outstanding Official Action did not note or acknowledge the Information Disclosure Statements filed by the Applicants in this application by providing the Applicants with signed, dated and initialed copy of the Form PTO/SB/08a/b submitted therewith in confirmation of the consideration of the art listed therein. Such action is respectfully requested.

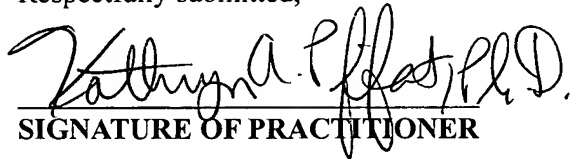
In addition, it is also respectfully noted for the record that the currently outstanding Official Action did not acknowledge Applicants' claim for foreign priority under 35 U.S.C. 119(a)-(d) or (f), and Applicants' submission of the required certified copies of the Priority Documents. Such action is respectfully requested.

Finally, it is respectfully noted for the record that the currently outstanding Official Action did not acknowledge or accept the formal drawings filed concurrently with the above-identified application. Such action is respectfully requested.

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Further, Applicants believe that additional fees beyond those submitted herewith are not required in connection with the consideration of this response to the currently outstanding Official Action. However, if for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, you are hereby authorized and requested to charge and/or credit Deposit Account No. **04-1105**, as necessary, for the correct payment of all fees which may be due in connection with the filing and consideration of this communication.

Respectfully submitted,


SIGNATURE OF PRACTITIONER

Date: April 15, 2010

Reg. No.: 34901

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